



FAST CMOS OCTAL BUFFER/LINE DRIVER

IDT74FCT2240AT/CT

FEATURES:

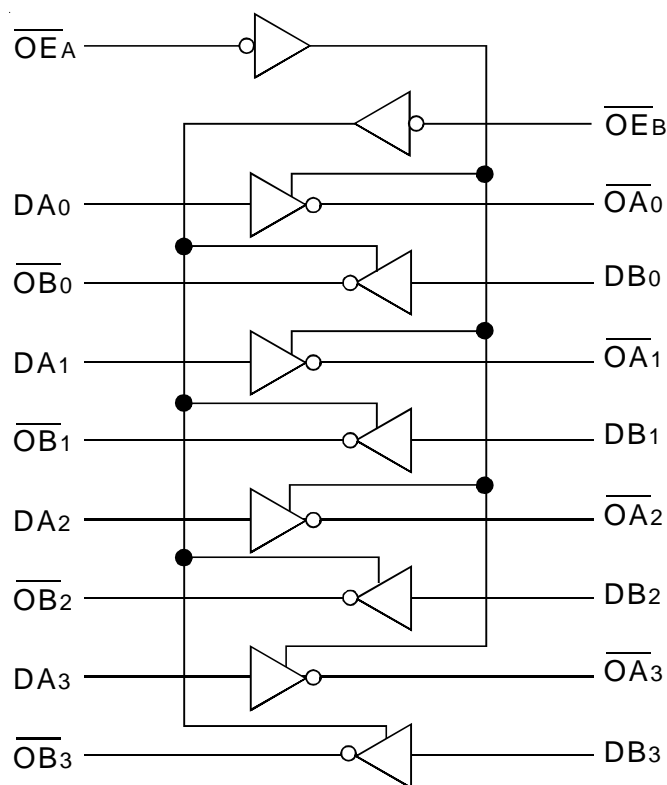
- A and C grades
- Low input and output leakage $\leq 1\mu\text{A}$ (max.)
- CMOS power levels
- True TTL input and output compatibility:
 - $V_{OH} = 3.3V$ (typ.)
 - $V_{OL} = 0.3V$ (typ.)
- Meets or exceeds JEDEC standard 18 specifications
- Resistor outputs (-15mA IOH, 12mA IOL)
- Reduced system switching noise
- Available in SOIC and QSOP packages

DESCRIPTION:

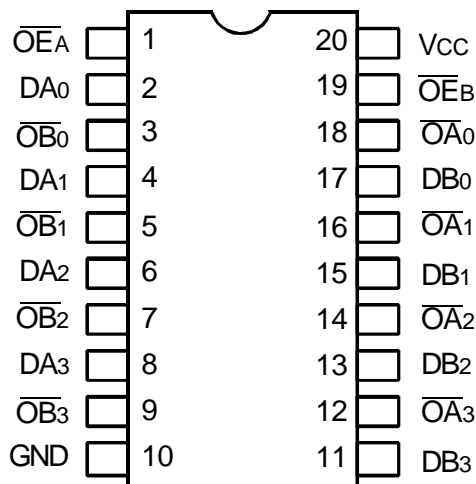
The IDT octal buffer/line driver is built using an advanced dual metal CMOS technology. The FCT2240T is designed to be employed as a memory and address driver, clock driver, and bus-oriented transmitter/receiver which provides improved board density.

The FCT2240T has balanced output drive with current limiting resistors. This offers low ground bounce, minimal undershoot, and controlled output fall times, reducing the need for external series terminating resistors. The FCT2240T is a plug-in replacement for the FCT240T.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Description | Max | Unit |
|----------------------------------|--------------------------------------|------------------------------|------|
| V _{TERM} ⁽²⁾ | Terminal Voltage with Respect to GND | -0.5 to +7 | V |
| V _{TERM} ⁽³⁾ | Terminal Voltage with Respect to GND | -0.5 to V _{CC} +0.5 | V |
| T _{STG} | Storage Temperature | -65 to +150 | °C |
| I _{OUT} | DC Output Current | -60 to +120 | mA |

NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability. No terminal voltage may exceed V_{CC} by +0.5V unless otherwise noted.
- Inputs and V_{CC} terminals only.
- Output and I/O terminals only.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

| Symbol | Parameter ⁽¹⁾ | Conditions | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 6 | 10 | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 8 | 12 | pF |

NOTE:

- This parameter is measured at characterization but not tested.

PIN DESCRIPTION

| Pin Names | Description |
|-------------------------------------|---|
| $\overline{OE}A$, $\overline{OE}B$ | 3-State Output Enable Inputs (Active LOW) |
| D _{xx} | Inputs |
| $\overline{O}xx$ | Outputs |

FUNCTION TABLE⁽¹⁾

| Inputs | | | Outputs |
|------------------|------------------|---|---------|
| $\overline{OE}A$ | $\overline{OE}B$ | D | |
| L | L | L | H |
| L | L | H | L |
| H | H | X | Z |

NOTE:

- H = HIGH Voltage Level
X = Don't Care
L = LOW Voltage Level
Z = High Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

| Symbol | Parameter | Test Conditions ⁽¹⁾ | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-----------|--|--|---------------------|------|---------------------|---------|---------------|
| V_{IH} | Input HIGH Level | Guaranteed Logic HIGH Level | | 2 | — | — | V |
| V_{IL} | Input LOW Level | Guaranteed Logic LOW Level | | — | — | 0.8 | V |
| I_{IH} | Input HIGH Current | $V_{CC} = \text{Max.}$ | $V_I = 2.7\text{V}$ | — | — | ± 1 | μA |
| I_{IL} | Input LOW Current | $V_{CC} = \text{Max.}$ | $V_I = 0.5\text{V}$ | — | — | ± 1 | μA |
| I_{OZH} | High Impedance Output Current (3-State Output Pins) | $V_{CC} = \text{Max.}$ | $V_I = 2.7\text{V}$ | — | — | ± 1 | μA |
| I_{OZL} | | | $V_I = 0.5\text{V}$ | — | — | ± 1 | |
| I_I | Input HIGH Current | $V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$ | | — | — | ± 1 | μA |
| V_{IK} | Clamp Diode Voltage | $V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$ | | — | -0.7 | -1.2 | V |
| V_H | Input Hysteresis | — | | — | 200 | — | mV |
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$ $V_{IN} = \text{GND or } V_{CC}$ | | — | 0.01 | 1 | mA |

OUTPUT DRIVE CHARACTERISTICS

| Symbol | Parameter | Test Conditions ⁽¹⁾ | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-----------|---------------------|---|-------------------------|------|---------------------|------|------|
| I_{ODL} | Output LOW Current | $V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$ | | 16 | 48 | — | mA |
| I_{ODH} | Output HIGH Current | $V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$ | | -16 | -48 | — | mA |
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OH} = -15\text{mA}$ | 2.4 | 3.3 | — | V |
| V_{OL} | Output LOW Voltage | $V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$ | $I_{OL} = 12\text{mA}$ | — | 0.3 | 0.5 | V |

NOTES:

- For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0\text{V}$, $+25^{\circ}\text{C}$ ambient.
- Not more than one output should be tested at one time. Duration of the test should not exceed one second.

POWER SUPPLY CHARACTERISTICS

| Symbol | Parameter | Test Conditions ⁽¹⁾ | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-----------------|---|--|--|------|---------------------|---------------------|------------|
| ΔI_{CC} | Quiescent Power Supply Current TTL Inputs HIGH | $V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$ | | — | 0.5 | 2 | mA |
| I_{CCD} | Dynamic Power Supply Current ⁽⁴⁾ | $V_{CC} = \text{Max.}$ Outputs Open \overline{OE}_A or $\overline{OE}_B = \text{GND}$ One Input Toggling 50% Duty Cycle | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | — | 0.06 | 0.12 | mA/ MHz |
| I_C | Total Power Supply Current ⁽⁶⁾ | $V_{CC} = \text{Max.}$ Outputs Open $f_i = 10\text{MHz}$ 50% Duty Cycle \overline{OE}_A or $\overline{OE}_B = \text{GND}$ One Bit Toggling | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | — | 0.6 | 2.2 | mA |
| | | | $V_{IN} = 3.4V$ $V_{IN} = \text{GND}$ | — | 0.9 | 3.2 | |
| | | $V_{CC} = \text{Max.}$ Outputs Open $f_i = 2.5\text{MHz}$ 50% Duty Cycle \overline{OE}_A or $\overline{OE}_B = \text{GND}$ Four Bits Toggling | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | — | 1.2 | 3.4 ⁽⁵⁾ | |
| | | | $V_{IN} = 3.4V$ $V_{IN} = \text{GND}$ | — | 3.2 | 11.4 ⁽⁵⁾ | |

NOTES:

- For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
 - Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.
 - Per TTL driven input ($V_{IN} = 3.4V$). All other inputs at V_{CC} or GND .
 - This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
 - Values for these conditions are examples of ΔI_{CC} formula. These limits are guaranteed but not tested.
 - $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} \text{DHNT} + I_{CCD} (f_{CP}/2 + f_i N_i)$
 $I_{CC} = \text{Quiescent Current}$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$
 $DH = \text{Duty Cycle for TTL Inputs High}$
 $NT = \text{Number of TTL Inputs at } DH$
 $I_{CCD} = \text{Dynamic Current caused by an Input Transition Pair (HLH or LHL)}$
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$
 $f_i = \text{Output Frequency}$
 $N_i = \text{Number of Outputs at } f_i$
- All currents are in milliamps and all frequencies are in megahertz.

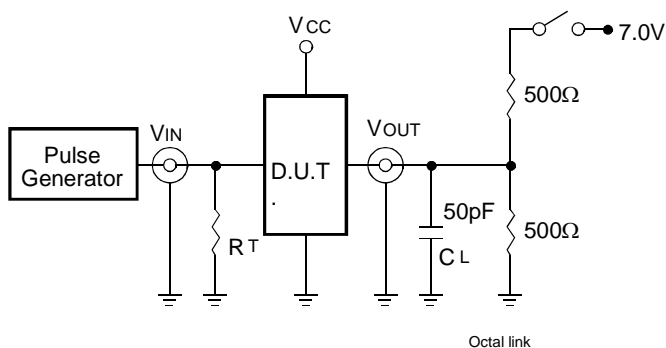
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

| Symbol | Parameter | Condition ⁽¹⁾ | FCT2240AT | | FCT2240CT | | Unit |
|-----------|---------------------------|--|---------------------|------|---------------------|------|------|
| | | | Min. ⁽²⁾ | Max. | Min. ⁽²⁾ | Max. | |
| t_{PLH} | Propagation Delay | $C_L = 50\text{pF}$ $R_L = 500\Omega$ | 1.5 | 4.8 | 1.5 | 4.3 | ns |
| t_{PHL} | D_x to \overline{O}_x | | | | | | |
| t_{PZH} | Output Enable Time | | 1.5 | 6.2 | 1.5 | 5.8 | |
| t_{PZL} | Output Disable Time | | | | | | |
| t_{PHZ} | | | 1.5 | 5.6 | 1.5 | 5.2 | ns |
| t_{PLZ} | | | | | | | |

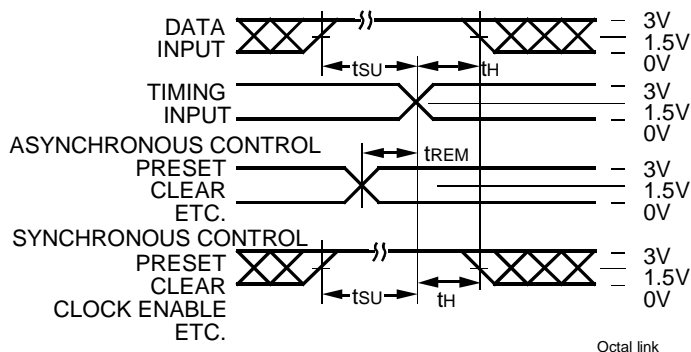
NOTES:

- See test circuit and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delays.

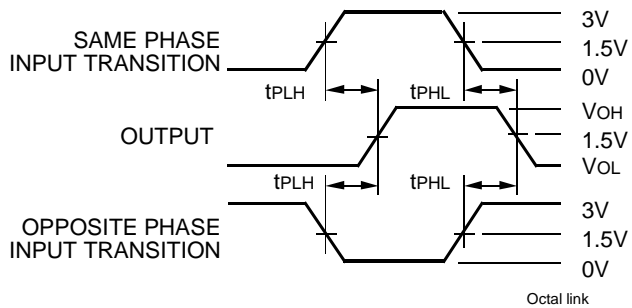
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



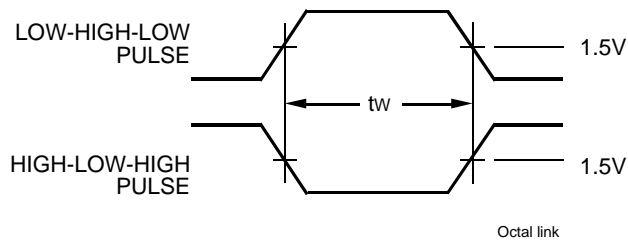
Propagation Delay

SWITCH POSITION

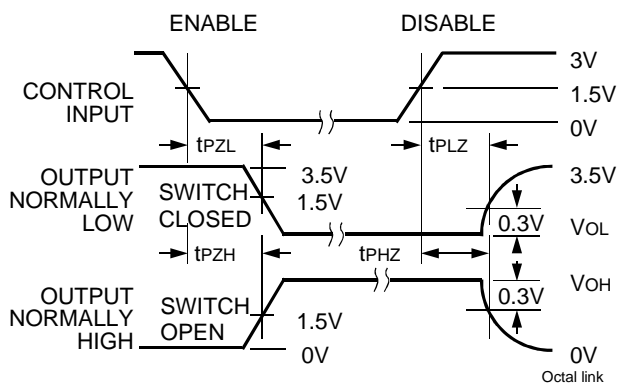
| Test | Switch |
|---|--------|
| Open Drain Disable Low Enable Low | Closed |
| All Other Tests | Open |

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



Pulse Width

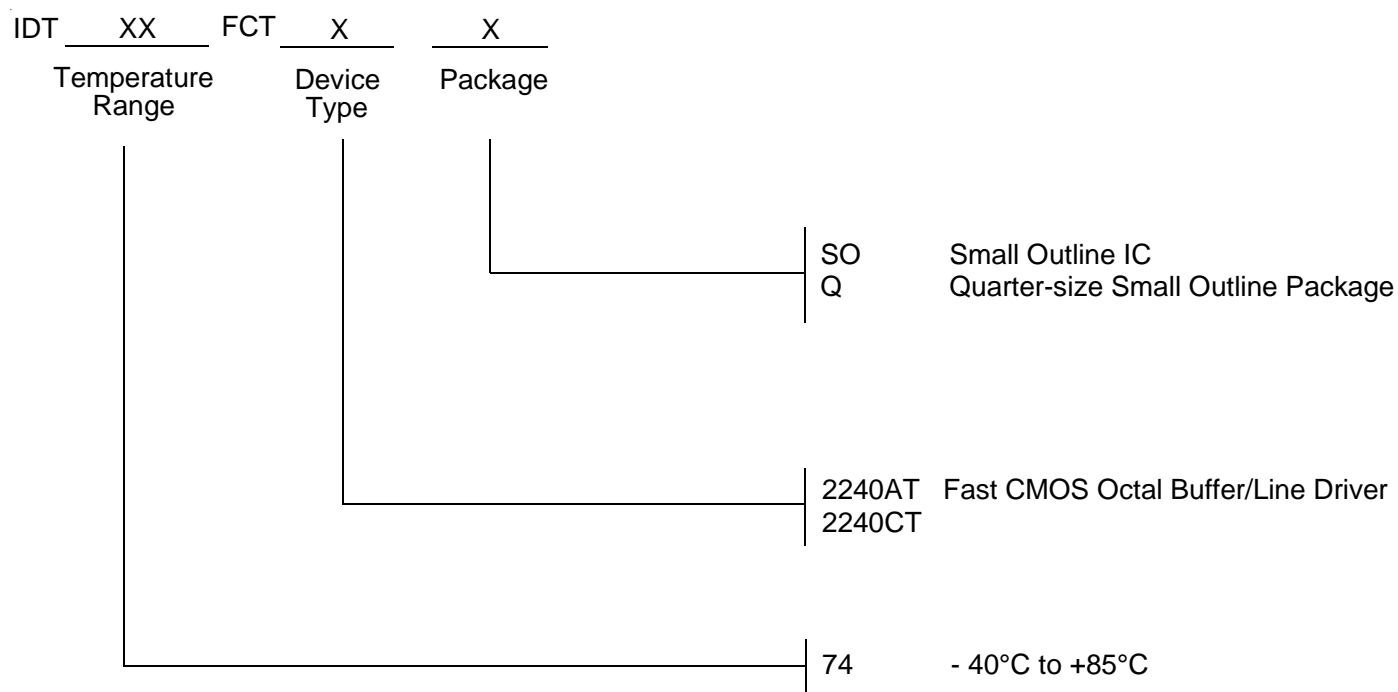


Enable and Disable Times

NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $t_r \leq 2.5\text{ns}$; $t_f \leq 2.5\text{ns}$.

ORDERING INFORMATION



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